


Appl. No.: 10/800,470  
Applicant: Xu Zhu  
Filed: 15 March 2004  
Title: ULTRATHIN FORM FACTOR MEMS MICROPHONES AND  
MICROSPEAKERS  
Art Unit: 2891  
Examiner: Igwe U. Anya  
Docket No.: DB001092-001



**Declaration of Dr. Kaigham J. Gabriel**

1. I, Dr. Kaigham J. Gabriel, of 5501 Aylesboro Avenue, Pittsburgh, Pennsylvania, do state as follows.
2. I have a B.S. (1977) from the University of Pittsburgh and both an M.S. (1979) and a Sc.D. (1983) from the Massachusetts Institute of Technology.
3. In 1985, I led the development of IC-Based MEMS while working at AT&T Bell Laboratories.
4. I spent five years with DARPA, where I started and managed DARPA's MEMS Program as Director of the Electronics Technology Office. In that position I was responsible for roughly half of the U.S. government's electronics technology investments.
5. Following my position with DARPA, I served as a Professor of both Electrical and Computer Engineering and at the Robotics Institute at Carnegie Mellon University. I have also been a visiting professor for the Institute of Industrial Science at the University of Tokyo, heading joint research projects with IBM, Toyoto and Ricoh, as well as a visiting scientist at the Naval Research Laboratory.
6. I am a Co-founder of, and Chairman and Chief Technology Officer for, Akustica, Inc. Akustica's initial focus is on the use of MEMS membranes for use in integrated speaker and microphone applications.
7. My honors include: World Economic Forum 2003 Technology Pioneer,; MIT's Carlton Tucker Prize for Excellence in Teaching; co-chair of the Defense Science Board 1999

Summer Study on 21<sup>st</sup> Century Technology Trends and Evolution; selection for personal technology briefings to the U.S. Secretary of Defense.

8. Representative publications include:

A. Berlin and K.J. Gabriel, "Distributed MEMS: New Challenges for Computation," *IEEE Computational Science and Engineering Journal*, vol. 4, no. 1, pp. 12-16, 1997.

K.J. Gabriel, "Engineering Microscopic Machines," 150<sup>th</sup> Anniversary Issue, *Scientific American: Technology in the 21<sup>st</sup> Century*, vol. 273, no. 3, pp. 150-153, September 1995.

K.J. Gabriel, O. Tabata, and S. Sugiyama, "Surface-Normal Electrostatic Pneumatic Actuators," *Technical Proceedings of MEMS '92*, Travemunde, Germany, pp. 110-114, February 1992.

M. Mehregany, K.J. Gabriel, and W.S. Trimmer, "Integrated Fabrication of Polysilicon Mechanisms," *IEEE Transactions on Electron Devices*, vol. 35, no. 6, pp. 719-723, 1988.

9. I am familiar with the contents of U.S. patent application serial number 10/800,470 (the '470 application). Claim 1 of the '470 application recites:

A process, comprising:

performing certain process steps from the top side of a substrate carrying a plurality of devices, at least certain of the devices having a micro-machined mesh;

attaching a carrier wafer to the top of the substrate;

reducing the thickness of the substrate;

continuing the process of fabricating the plurality of devices from the back side of the substrate; and

releasing said micro-machined meshes.

10. Examples of meshes can be seen in cross-section in, for example, figures 1-8 of the '470 application, with figure 8 illustrating the mesh released (i.e. separated from) the supporting substrate.

11. A top view looking down on an example of a mesh is found in International Publication No. WO/01/20948 A2 published 22 March 2001, (the '948 publication) at figures 3C

and 4, which are attached hereto as Exhibit 1. The '948 publication is incorporated by reference into the '470 application (see paragraph 0004); I am a named inventor on the '948 publication.

12. I have reviewed the Office action mailed 15 November 2005, particularly the following portions from paragraph 3:

Tu teaches a process, comprising:

performing certain process steps from the top side of a substrate  
carrying a plurality of devices, at least certain of the devices  
having a micro-machined mesh (figs. 4-10);

13. I have reviewed U.S. Patent No. 6,602,427 issued to Tu entitled Micromachined Optical Mechanical Modulator Based Transmitter/Receiver Module (the '427 patent). I find no structure in the device disclosed in the '427 patent which would be understood by a person of ordinary skill in the art to be a mesh.

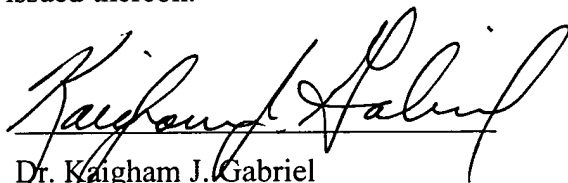
14. The '427 patent is directed to a specific type of device – an optical mechanical modulator. As described in column 1, lines 51 - 61:

Several micromachined optical mechanical modulators have been reported. FIG. 1A and FIG. 1B show a micromachined optical mechanical modulator consisting of a single crystalline silicon substrate 101, an Aluminum supporting frame 102, an air gap 103, and a silicon nitride membrane 104. The silicon nitride membrane 104 is defined as the area released from the single crystalline silicon substrate 101 and consists of the central plate 106 suspended by thin support beams 107. An opening in the electrode material on the central plate 106 of the device defines an optical window 108.

15. There is nothing in figures 4 through 10 of the '427 patent that teaches the fabrication of a mesh. A membrane is formed which is separated from the remainder of the device by four Z-shaped legs extending outwardly from the central square area and defining four openings 414 between them. See column 7, lines 4 through 6. If the examiner's position that the openings 414 between the Z-shaped legs supporting the membrane formed a mesh was correct, then virtually every MEMS device would be a mesh because MEMS devices are typically suspended above the substrate by one or more arms, legs, or beams. Thus, the examiner's characterization of figures 4 through 10 as illustrating the fabrication of a MEMS mesh is not correct.

16. A person of ordinary skill in the art, upon examining figures 4 through 10 of the '427 patent would not conclude that the openings 414 between supporting Z-shaped legs turn the membrane into a mesh.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information or belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

  
Dr. Kaigham J. Gabriel

5/12/06  
Date

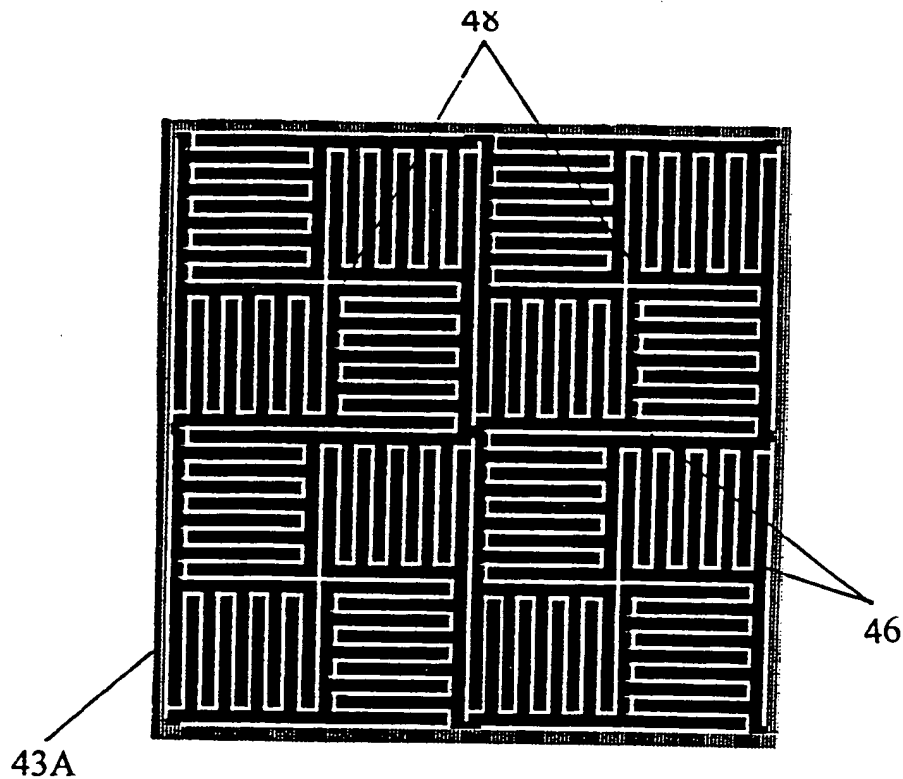


FIG. 3C

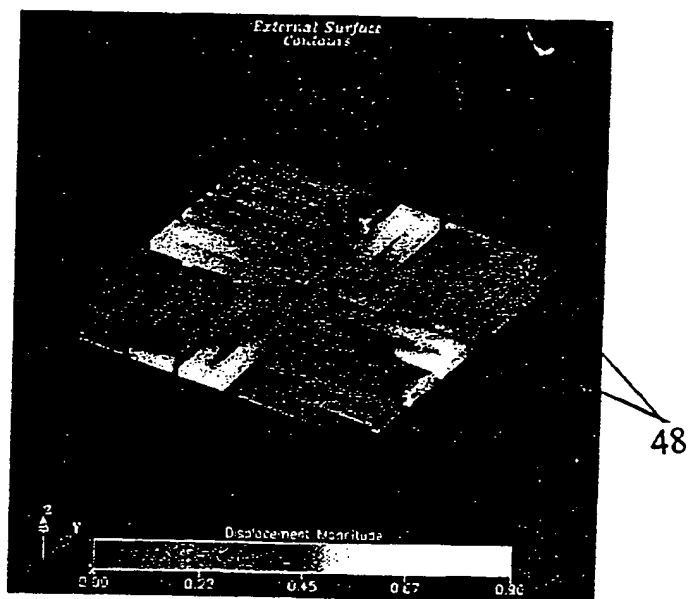


FIG. 3D

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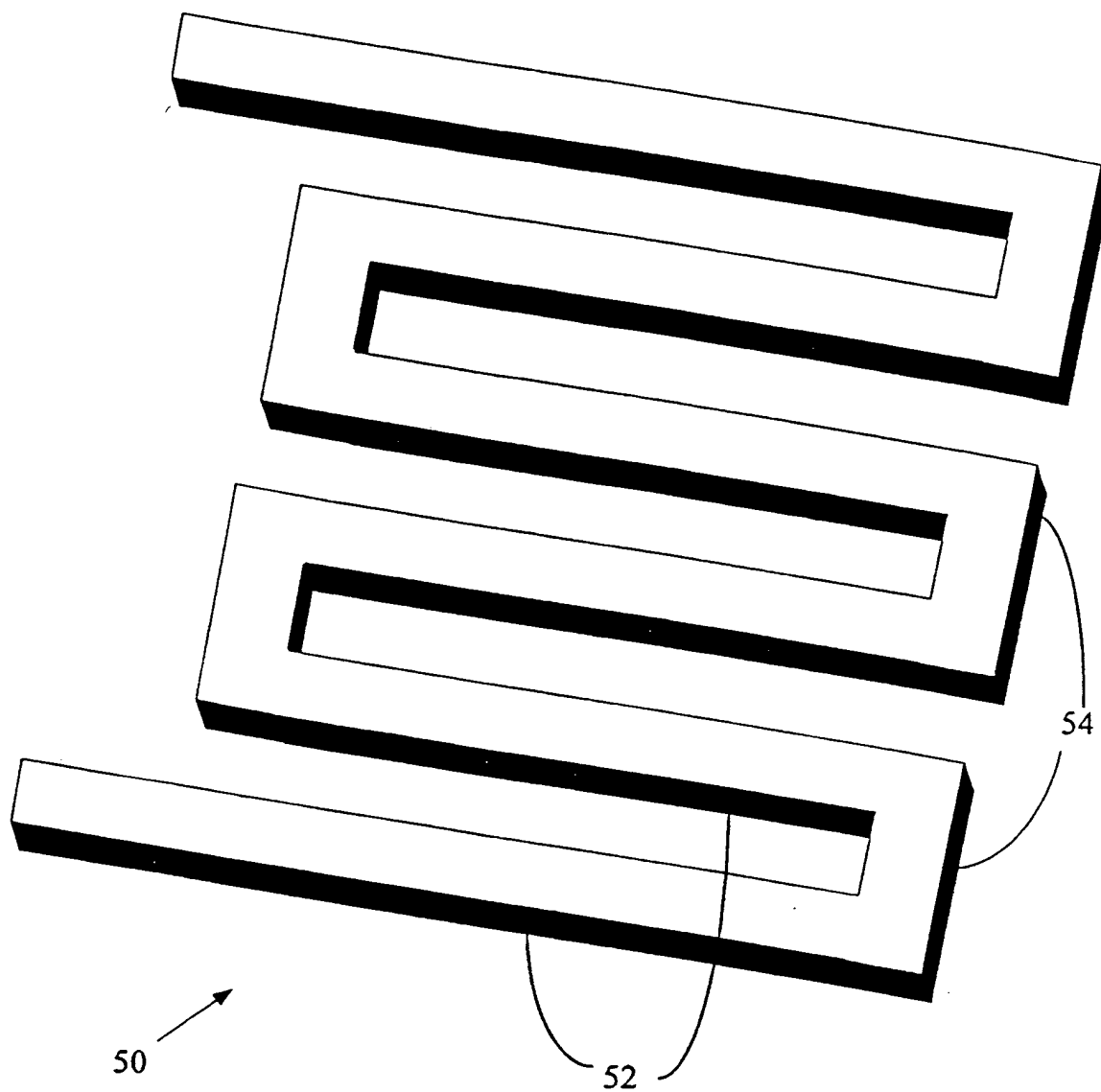


FIG. 4